

50 Having thus described the preferred embodiments, the
invention is now claimed to be:

1. A vacuum cleaner comprising:

- 55 a housing having a cyclonic airflow chamber for separating contaminants from a suction airstream, said housing including a floor, a top wall, a suction airstream inlet, and a suction airstream outlet, said airstream inlet and said airstream outlet being in fluid communication with said cyclonic airflow chamber;
- 60 a suction opening defined on said housing, said suction opening being fluidically connected with said airstream inlet;
- 65 an airstream suction source located on said housing, said suction source having an inlet fluidically connected to said airstream outlet and a suction source exhaust outlet, said suction source selectively establishing and maintaining a suction airstream from said suction opening to said suction source exhaust outlet;

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a main filter support extending upwardly from the floor of the housing for releasably securing a main filter element centrally in said cyclonic airflow chamber;
a main filter element secured to said main filter support;
and,

a dirt cup selectively positioned in said housing, said main filter element being positioned in said dirt cup.

2. The vacuum cleaner of claim 1 further comprising an upper conduit depending from said top wall and including an outlet passage therethrough in communication with the suction airstream outlet of said housing, said upper conduit including a lower edge adapted for sealingly engaging the main filter element so that said upper conduit and said main filter element together define a column extending between said floor and said top wall of said housing, whereby a suction airstream passing through said cyclonic airflow chamber from said suction airstream inlet to said suction airstream outlet passes through the main filter element, into said upper conduit, and exits said chamber through said suction airstream outlet.

3. The vacuum cleaner as set forth in claim 1 wherein said main filter element comprises high-density polyethylene porous filter media having pores with an average pore size of approximately 45 μm to approximately 90 μm .

4. The vacuum cleaner as set forth in claim 1 wherein said housing is defined by an upper housing member, wherein said upper housing member includes said top wall and an upper conduit depending from said top wall, and said dirt cup.

5. The vacuum cleaner of claim 4 wherein said dirt cup is pivotable between a closed, operative position and an open position, said dirt cup including said floor, said filter element extending upwardly from the floor and including an upper edge at a level substantially equal to an upper edge of the dirt cup, and said upper conduit depending downwardly and including a lower edge at a level substantially equal to the upper edge of said dirt cup, said vacuum cleaner further comprising a gasket disposed between said filter element upper edge and said lower edge of said upper conduit so that said main filter element and said lower edge of the upper conduit sealingly mate in an airtight manner when said dirt cup is in the closed, operative position, wherein said upper edge of said dirt cup is defined by an inclined edge such that when said dirt cup is pivoted fully into the open position, the inclined upper edge is located in a substantially horizontal plane to inhibit spillage of the separated dirt and dust.

6. The vacuum cleaner as set forth in claim 2 further comprising

an auxiliary filter element positioned in said upper conduit, said auxiliary filter element being so positioned that airflow exiting said cyclonic airflow chamber through said upper conduit passes therethrough and is filtered of residual dust and dirt; and,

an auxiliary filter support framework extending across an outlet passage defined in said upper conduit for supporting said auxiliary filter element in a blocking relationship relative to said outlet passage of said upper conduit.

7. The vacuum cleaner as set forth in claim 1 further comprising a final filter assembly positioned on the vacuum cleaner, said final filter assembly being in fluid communication with said suction source exhaust outlet for filtering said suction airstream exhausted from said suction source exhaust outlet and for discharging said suction airstream into the atmosphere.

8. The vacuum cleaner as set forth in claim 7 wherein said final filter assembly comprises a high efficiency particulate arrest (HEPA) filter media.

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9. An upright vacuum cleaner comprising:
an upright housing section including a handle;
a nozzle base section hingedly interconnected with the upright housing section, said nozzle base section including a main suction opening formed in an underside thereof;
a cyclonic airflow chamber defined in said upright housing section for separating dust and dirt from a suction airstream;
a suction source located in one of said upright housing section and said nozzle base section and having a suction airflow inlet in fluid communication with said cyclonic airflow chamber and a suction airflow outlet; and,
a main filter element located in said cyclonic chamber upstream from said suction source for filtering residual dust and dirt from a suction airstream passing through said cyclonic airflow chamber, said main filter element extending upwardly within said cyclonic airflow chamber from a floor of said housing section, wherein a lower portion of said cyclonic airflow chamber is defined by a dirt container for receiving and retaining dirt and dust separated from said suction airstream.
10. The upright vacuum cleaner as set forth in claim 9 further comprising a final filter assembly located on one of said housing and said nozzle base, said final filter assembly being connected in fluid communication with said suction airflow outlet of said suction source for filtering said suction airstream exhausted by said suction source prior to said suction airstream being dispersed into the atmosphere, wherein said final filter assembly comprises a high efficiency particulate arrest (HEPA) filter media.
11. The upright vacuum cleaner as set forth in claim 9 wherein said main filter element comprises porous high-density polyethylene filter media.
12. The upright vacuum cleaner as set forth in claim 11 wherein said porous filter media has pores with an average pore size of less than approximately 90 μm .
13. The upright vacuum cleaner as set forth in claim 11 further comprising an upper conduit depending from a top wall of said upright housing section, wherein said upper conduit includes an outlet passage formed therethrough in fluid communication with a suction airstream outlet of said cyclonic airflow chamber, said main filter element secured in a blocking relation with said outlet passage of said upper conduit so that said suction airstream passes through said main filter element prior to exiting said cyclonic airflow chamber.
14. The upright vacuum cleaner as set forth in claim 13 wherein said upper conduit includes an auxiliary filter positioned in said outlet passage for filtering residual dust and dirt from the suction airstream after the suction airstream passes through said main filter element.
15. The upright vacuum cleaner as set forth in claim 13 wherein an upper end of said main filter element is sealingly engaged with a lower end of said upper conduit.
16. A vacuum cleaner comprising:
a nozzle section;
a housing section connected to said nozzle section and in fluid communication with said nozzle section;
a cyclonic airflow chamber located in said housing section for separating dirt and dust from a suction airstream flowing into said housing section between an inlet located at a periphery of said housing section and an outlet located along a longitudinal centerline of said housing section;

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an upper conduit depending from a top wall of said cyclonic airflow chamber and including a passage therein in communication with said outlet of said housing section; and,

a main filter element extending upwardly from a floor of said cyclonic airflow chamber in a central portion of said chamber so that an annulus is defined between said main filter element and the housing portion defining said chamber, said main filter element sealingly engaged with said passage in said upper conduit and adapted for filtering residual dust and dirt from said suction airstream prior to said suction airstream exiting said cyclonic airflow chamber.

17. The vacuum cleaner of claim 16 wherein said housing section comprises a dirt container defining a lower portion of said cyclonic airflow chamber and adapted for receiving and retaining dirt and dust separated from said suction airstream, said container being pivotable between an operative position and an open position and including an open upper end defined by an inclined edge such that when said dirt container is pivoted fully into the open position, the inclined edge is located in a substantially horizontal plane to inhibit spillage of the separated dirt and dust.

18. The vacuum cleaner as set forth in claim 16 further comprising:

a main suction opening located in said nozzle section and connected to a suction airstream inlet of said cyclonic chamber; and,

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a suction source located on said housing section, and connected to said outlet thereof, for suctioning an airstream from said nozzle main suction opening into and through said cyclonic chamber to an exhaust outlet of said suction source.

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19. The vacuum cleaner as set forth in claim 18 further comprising a final filter chamber connected to said exhaust outlet of said suction source and a final filter element for filtering contaminants from said airstream exhausted by said suction source.

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20. The vacuum cleaner as set forth in claim 19 wherein said final filter element comprises high efficiency particulate arrest filter media.

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21. The vacuum cleaner as set forth in claim 16 wherein said main filter element comprises high density polyethylene porous filter media having an average pore size of approximately 45 μm to approximately 90 μm .

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22. The vacuum cleaner as set forth in claim 16 wherein a portion of said suction airstream in said cyclonic airflow chamber passes through accumulated dust and dirt separated from said suction airstream so that said accumulated dust and dirt acts as a filter media to separate residual dust and dirt from said portion of said suction airstream prior to said portion of said suction airstream passing through said main filter element.

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23. A vacuum cleaner comprising:
a body section having a cyclonic airflow chamber for
separating contaminants from a suction airstream;
a suction opening communicating with said body
5 section, said suction opening being fluidly connected to said
cyclonic airflow chamber;
a main filter housing connected to said body
section, said main filter housing being located within said
cyclonic airflow chamber;
10 a filter element mounted in said main filter
housing, wherein said main filter housing comprises a
plurality of apertures so that an airstream can flow from said
cyclonic airflow chamber into said main filter housing; and,
an airstream suction source located on said body
15 section, said suction source communicating with said main
filter housing.

24. The vacuum cleaner of claim 23, wherein at
least a portion of said main filter housing is selectively
detachable from said body section.

25. The vacuum cleaner of claim 24, wherein said
filter element is selectively retained within said at least
a portion of said main filter housing.

26. The vacuum cleaner of claim 24, wherein said
at least a portion of said main filter housing comprises at
least one tab extending therefrom, wherein said at least one
tab of said at least a portion of said main filter housing
5 cooperates with adjacent elements mounted on said body section
to secure said at least a portion of said main filter housing
to said body section.

27. The vacuum cleaner of claim 24, wherein said
main filter housing comprises an airflow outlet which
communicates with said airstream suction source.

28. The vacuum cleaner of claim 23, wherein said
filter element is approximately frusto-conical in shape.

29. The vacuum cleaner of claim 23, wherein said filter element comprises a thermoplastic material.

30. The vacuum cleaner of claim 23, wherein said main filter housing comprises a closed bottom end.

31. The vacuum cleaner of claim 30, wherein said bottom end of said main filter housing has a diameter that is larger than is a diameter of an adjacent portion of said main filter housing.

32. A vacuum cleaner comprising;
a nozzle base;
an upright body section pivotably mounted on said nozzle base;
5 a cyclonic airflow chamber defined in said upright body section, wherein said cyclonic airflow chamber comprises an airflow inlet and an airflow outlet;
a suction opening defined in said nozzle base, said suction opening being fluidly connected with said airflow inlet of said cyclonic chamber;
10 an airstream suction source located on one of said nozzle base and said upright body section, said suction source having an inlet fluidly connected to said airflow outlet of said cyclonic chamber and an exhaust outlet;
15 a main filter housing connected to said upright body section, said main filter housing being located within said cyclonic airflow chamber; and,
a filter element mounted in said main filter housing, wherein said main filter housing comprises a
20 plurality of apertures so that an airstream can flow from said cyclonic airflow chamber into said main filter housing.

33. The vacuum cleaner of claim 32, wherein said airflow outlet of said cyclonic airflow chamber is coaxial with a longitudinal axis of said cyclonic airflow chamber.

34. The vacuum cleaner of claim 32, wherein said filter element is substantially coaxial with a longitudinal axis of said cyclonic airflow chamber.

35. The vacuum cleaner of claim 32, wherein said airflow inlet of said cyclonic airflow chamber is tangential to a longitudinal axis of said cyclonic airflow chamber.

36. The vacuum cleaner of claim 32, further comprising a conduit fluidly connecting said suction opening of said nozzle base with said airflow inlet of said cyclonic airflow chamber.

37. The vacuum cleaner of claim 32, wherein at least a portion of said main filter housing is selectively detachable from said upright body section.

38. The vacuum cleaner of claim 37, wherein said filter element is selectively retained within said at least a portion of said main filter housing.

39. The vacuum cleaner of claim 32, wherein said main filter housing comprises an airflow outlet which communicates with said airstream suction source.

40. The vacuum cleaner of claim 32, wherein said filter element is approximately frusto-conical in shape.

41. The vacuum cleaner of claim 32, wherein said filter element comprises a thermoplastic material.

42. A vacuum cleaner comprising:

a body section having a cyclonic airflow chamber for separating contaminants from a suction airstream;

5 a suction opening defined on said body section, said suction opening being located upstream from said cyclonic airflow chamber and communicating therewith;

an airstream suction source located on said body section, said suction source being located downstream from said cyclonic airflow chamber and communicating therewith;

10 a main filter housing located within said cyclonic airflow chamber; and,

a filter element mounted in said main filter

housing, wherein said main filter housing comprises a plurality of apertures so that an airstream can flow from said cyclonic airflow chamber through said filter element and toward said airstream suction source.

43. The vacuum cleaner of claim 42, further comprising a dirt cup, wherein said cyclonic airflow chamber is at least partially located within said dirt cup.

44. The vacuum cleaner of claim 43, wherein said main filter housing is arranged substantially coaxial with a longitudinal axis of said dirt cup.

45. The vacuum cleaner of claim 42, wherein said main filter housing is arranged substantially coaxial with a longitudinal axis of said cyclonic airflow chamber.

46. The vacuum cleaner of claim 42, wherein said cyclonic airflow chamber comprises an airflow outlet which is substantially coaxial with a longitudinal axis of said cyclonic airflow chamber.

47. The vacuum cleaner of claim 42, wherein said cyclonic airflow chamber comprises an airflow inlet which is substantially tangential to a longitudinal axis of said cyclonic airflow chamber.

48. The vacuum cleaner of claim 47, further comprising a conduit fluidly connecting said suction opening of said body section with said cyclonic airflow chamber.

49. The vacuum cleaner of claim 42, wherein said filter element is approximately frusto-conical in shape.

50. The vacuum cleaner of claim 49, wherein said filter element comprises a thermoplastic material.

51. The vacuum cleaner of claim 42, wherein at least a portion of said main filter housing is selectively

detachable from said body section, thereby allowing access to said filter element.

52. A vacuum cleaner comprising:

a body section having a cyclonic airflow chamber defined therein;

a suction opening defined on said body section, said suction opening being located upstream from said cyclonic airflow chamber and communicating therewith;

a main filter housing located within said cyclonic airflow chamber;

a filter element selectively mounted in said main filter housing wherein said filter element and said main filter housing cooperate to define a tortuous airflow path; and,

an airstream suction source located on said body section, said suction source being located downstream from said cyclonic airflow chamber and communicating therewith.

53. The vacuum cleaner of claim 52, wherein said cyclonic airflow chamber comprises an airflow outlet, wherein said main filter housing is located adjacent said airflow outlet.

54. The vacuum cleaner of claim 53, wherein said main filter housing comprises a plurality of apertures so that an airstream can flow from said cyclonic airflow chamber into said main filter housing, through said filter element and toward said airstream suction source.

55. The vacuum cleaner of claim 53, wherein said airflow outlet of said cyclonic airflow chamber is substantially coaxial with a longitudinal axis of said cyclonic airflow chamber.

56. The vacuum cleaner of claim 52, further comprising a dirt cup mounted in said body section, wherein said cyclonic airflow chamber is at least partially located within said dirt cup.

57. The vacuum cleaner of claim 56, wherein said main filter housing is arranged substantially coaxial with a longitudinal axis of said dirt cup.

58. The vacuum cleaner of claim 52, wherein said main filter housing is arranged substantially coaxial with a longitudinal axis of said cyclonic airflow chamber.

59. The vacuum cleaner of claim 52, wherein said cyclonic airflow chamber comprises an airflow inlet, said airflow inlet being substantially tangential to a longitudinal axis of said cyclonic airflow chamber.

60. The vacuum cleaner of claim 52, wherein at least a portion of said main filter housing is selectively detachable from said body section.

61. The vacuum cleaner of claim 60, wherein said at least a portion of said main filter housing comprises tabs and is rotated to selectively detach said at least a portion of said main filter housing from said body section.

62. The vacuum cleaner of claim 60, wherein said filter element is selectively held in said at least a portion of said main filter housing.

63. The vacuum cleaner of claim 52, wherein said filter element is approximately frusto-conical in shape.

64. The vacuum cleaner of claim 63, wherein said filter element comprises a thermoplastic material.

65. The vacuum cleaner of claim 52, wherein said main filter housing comprises a closed bottom end.